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UNRAVELLING AND EXPLOITING MEDITERRANEAN SEA MICROBIAL DIVERSITY AND ECOLOGY FOR XENOBIOTICS' AND POLLUTANTS' CLEAN-UP THROUGH THE FP7 EU PROJECT ULIXES

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Abstract

The pollution of a relatively restricted basin like the Mediterranean Sea is associated to socio-economic problems. Besides the effects on biodiversity and wild life, marine oil spill disasters profoundly impact the economy of the affected areas due to reduction of tourism, reduction of fishing activities and the consequent loss of jobs and heritages. The increased number of polluted coastal and marine sites is now demanding careful strategies for remediation and clean-up. The European Commission has produced numerous efforts for developing research on novel strategies for the environmental protection of the Mediterranean Sea including the funding of research project devoted to the exploitation of microbial diversity for the developing novel bioremediation strategies. The EU-funded research project ULIXES aims to unravel, categorize, catalogue, exploit and manage the microbial diversity available in the Mediterranean Sea for addressing bioremediation of polluted marine sites. The idea behind ULIXES is that the multitude of diverse environmental niches of the Mediterranean Sea contains a huge range of microorganisms and their components (e.g. catabolic enzymes) or products (e.g. biosurfactant) that can be exploited in pollutant- and site-tailored bioremediation approaches. ULIXES intends to provide the proof of concept that it is possible to establish and exploit for bioremediation site-specific collections of microbial strains, mixed microbial cultures, enzymes, biosurfactants and other microbial products. These biotechnological resources are mined by using approaches based on isolation of culturable microorganisms as well as by extensively applying advanced novel ‘meta-omics’ technologies. Three pollutant classes recognized worldwide as environmental priorities are considered: petroleum hydrocarbons, chlorinated compounds and heavy metals. Through the effort of twelve European and Southern Mediterranean partner laboratories, a large set of polluted environmental matrices from sites located all over the Mediterranean Sea are explored, including seashore sands, lagoon sediments, deep sea sediments polluted by heavy oil hydrocarbons at oil tanker shipwreck sites, hypersaline waters and sediments from polluted salty coastal lakes and natural deep hypersaline anoxic submarine basins and mud volcanoes where hydrocarbon seepages occur. The mined collections of microbial biotechnological products are exploited for development of novel improved bioremediation processes whose effectiveness is proved by *ex situ* and *in situ* field bioremediation trials. A careful dissemination action is pursued to assure capillary information of the ULIXES results and products to stakeholders and SMEs operating in the sector of bioremediation.
